

IRANIAN AND ARMENIAN CONTRIBUTIONS TO THE BEGINNINGS OF GOTHIC ARCHITECTURE

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When Viollet-le-Duc published his *Encyclopedie* in 1866, he was sure that the origins of French Gothic architecture were to be found in France itself; that the slow, continuous development of primitive elements, traditional or regionally invented adequately explained the completed style. When, however, a few years later the Marquis de Vogüé published his great work, *Syrie Centrale*, Viollet-le-Duc was deeply impressed, and it was he who urged Marcel Dieulafoy, a railroad engineer of wide cultural interests and exceptional ability, to search the Near East for the origins of Gothic architecture.

¹ This article summarizes in a somewhat general fashion the thesis of lectures which the writer gave in the French universities in 1935 as Harvard Lecturer on the James Hazen Hyde Foundation. In its present condensed form it is essentially an hypothesis. A final appraisal of Iranian contributions to Gothic architecture would require a much fuller statement, more extended arguments and the citation of more monuments and more structural detail, and plan types which the circumstances of the moment quite forbid. The statement in its present form was given before a meeting of the Byzantine and Slavic Congress in the Iranian Institute, M. Gregoire presiding, on May 18. The writer has presumed on the good will of M. Baltusaitis and M. Vallery-Radot to borrow several illustrations from their books. It is reprinted from Vol. I, 1946, No. 2, of the former "Armenian Quarterly."

"Go beyond Syria to Persia, and perhaps you will find those beginnings," he counselled.

Dieulafoy accepted the advice and undertook a memorable journey throughout Persia, in which he made some notable discoveries. In his well-known publication of these results he interpreted some of the newly found monuments with acumen and sound imagination, despite his lack of sufficient background, and announced the thesis that the origins of Gothic architecture were Persian.² This idea created considerable excitement, and though it was, for the time being, accepted by a number of architects, provoked in other quarters violent opposition and even scorn. His arguments were vulnerable, for the Persian monuments which he thought significant were separated from their presumed effects in France by great distances and a still more serious gap in time. The elements which he noted were insufficient to estab-

² Marcel Dieulafoy, "L'Art Antique de la Perse," Paris, 1884. V, p. 145; idem, *Espagne et Portugal*, Paris, 1921; Francois Benoit, *L'Architecture, L'Orient Medieval et Moderne*, Paris, 1912, p. 69; Auguste Choisy, *L'Histoire de L'Architecture*, Vol. I, 1899. *passim*

lish his deductions, and no definite connections between the two styles were established. As a consequence, thoughtful historians, while admitting the probability of Near Eastern contributions to Romanesque architecture, almost unanimously rejected Dieulafoy's conception as unprovable and superfluous.

Dieulafoy could not sustain his contention because the more vital elements in Early Islamic Iranian architecture are to be found in occupied mosques, of which he managed to see only one or two, since they were all closed to infidels. Indeed, until recently attempts to enter have been few and at extreme risk. As late as February, 1925, the American Vice-Consul was murdered by a mob at Teheran merely for photographing a small street-fountain. Beginning in the early thirties some of the Isfahan mosques were opened one by one to Europeans, and other mosques also were gradually made available, though some are still inaccessible. From 1925 on the writer penetrated all the principal mosques of Iran, examined them with more or less leisure, and took several thousand photographs.³ The results have warranted a re-examination of Dieulafoy's theory, for his account can now be supplemented by new facts and observations.

Possible Iranian contributions to Gothic architecture cannot be evaluated without defining the essentials of the Gothic style, and on these there is no complete agreement. The old notion that its essential feature was the pointed arch is no longer acceptable. Five other elements are equally or more important, and it is the combination of these factors that constitutes true Gothic architecture. These are:

1. The transverse vault—a vault running at right angles to the main vault, which relieves the side wall from lateral pressure

and thus permits a wider vault and also a thinner wall which can be safely opened up for lighting.

2. The ribbed ogival vault—a vault in which a framework carries the load, leaving the intermediate panels of wall or vault relatively inert.

3. The pointed arch.

4. Compound piers, angle columns and column clusters.

5. The flying buttress—a daring contrivance which picks up the lateral thrust of the vault on the exterior, transmitting it across an open space.

6. In terms of style, a demand for emphatic verticality.

All these elements are to be found in Persia in examples which represent long established styles and techniques.

Gothic architecture is not a natural or inevitable development out of Romanesque building, as some scholars have argued, but represents, structurally, a series of striking innovations, of which the major elements are not to be found in the building techniques or styles of either France or Byzantium, as has been repeatedly asserted. Whether they are the product of spontaneous invention, as has been urged, not without vehemence, is a question which can be decided only by a detailed analysis of all the relevant facts, appraised in the light of historical principles and probabilities.

We can best understand why the French builders were driven to search for new methods of construction if we recall their problems. Because of the increasing wealth and population of the communes, the facilities of the older Romanesque churches with their restricted capacities, their narrow and dark naves, were dangerously insufficient. On important occasions they were jammed with excited crowds; hysteria and panic ensued, "for the narrowness of the place forced the women to run

³ Now the property of the Iranian Institute and School of Asiatic Studies, New York.

towards the altar upon the heads of men as if they were a pavement with much anguish and noisy confusion," Abbot Suger wrote,⁴ distressed at the unseemly violence of the communicants. More ample space was an obvious and immediate necessity.

Another imperative demand on the builders was for non-inflammable roofs. There was throughout the 11th and 12th centuries a ghastly series of holocausts which resulted principally from thunderstorms setting fire to timbered roofs.⁵ Again and again panic-stricken congregations choked the doorways, and victims by the hundreds were consumed as in a fiery furnace. Scores of these disasters notified the Church that this problem had to be solved.

Various solutions were attempted. One of the most resolute and interesting was a type taken over from Byzantium, with a series of domes (*coupoles en file*). There are nearly sixty of these churches still extant in Aquitaine, built from 1100 to 1160 (St. Font, St. Etienne in Périgueux, Cahors, Souillac; and in Charente, the Cathedral of Angoulême).⁶ These churches are simple and majestic, the interiors spacious, the structure secure; but they were not wholly satisfactory. They required huge masses of masonry which were very costly. The simplicity of the interiors becomes monotonous and bleak, insufficient to the need for verticality and elaboration inherent in the trend of taste of the time; the exteriors lack unified character, the domes competing with one another. Nor was the style sympathetic to the spirit of the period. It was imported, and had been

determined in Byzantium not only by structural tradition, but also by psychological motivations involving alien aesthetic and religious needs. It was necessary to look farther.

In addition to greater space and security, more light also was very desirable. If stone was substituted for the inflammable woodwork, the greatly increased lateral pressure required thicker walls which could be pierced safely only with rather low, narrow windows. An effort to strengthen the Romanesque type of vault with semi-circular ribs like barrel staves⁷ resulted in increasing the lateral thrust, and even when this was discharged onto piers, the roof between the ribs was not supported, so that thicker walls were necessary or, for economy, heavier contreforts to contain the thrusts. These contreforts cast shadows on the relatively small windows, so that in the winter, or on dark days, or early morning or evening the cathedral was indeed dim.

A strong, non-inflammable roof which could be built so as to widen the nave, a vaulting system light and strong which would also provide height, exciting richness and the dramatic display of complicated energies, a type of buttress which would permit better illumination, these were the pressing requirements which the builders earnestly strove to meet. The solutions were ready to hand in the Orient.

The beginnings of Gothic architecture can, with certain qualifications, be found in Sasanian structures, as Dieulafoy insisted sixty years ago. Here we find fully developed in monumental buildings the transverse vault, and with it the utilization of adjoining counterpoising vaults and arches which pick up and distribute the expanding thrusts of dome or nave. But more

⁴ E. Panofsky, Abbot Suger, Princeton Univ. Press, 1946, p. 43. See also p. 87.

⁵ Nearly one hundred destructive fires have been recorded. Many thousands were burned or trampled to death. Several churches were afflicted thus more than once.

⁶ For a brilliant discussion, see de Lasteyrie "L'Architecture Religieuse en France . . . Romane," pp. 788-800; also Vallery's admirable *Eglises Romanes*, Paris, pp. 116-142.

⁷ e.g. Cathedral at Digne, Eglise de Benevent-l'Abbaye (Creuse), examples in Poitou, Limousin, Bourgogne, cf. de Lasteyrie, *l'Architecture Religieuse en France . . . Romane*, pp. 238-249.

than this, the Sasanian architects who had, in Sasanian manner, been accustomed to clumsy and rather rapid building with inferior materials which, for political and imperial reasons, had to be constantly employed to the maximum for the most imposing effect, apparently began to be troubled by the massiveness of their walls. Perhaps the Chancellor of the Exchequer may also have protested against the cost of these mountains of mortar-set rubble. In the ruined palace of Sarvistan, which is datable at the beginning of the 5th century A.D., for the first time among extant monuments we find all effort to analyze a structure, to find other means of achieving stability than reliance on sheer weight. Here the homogeneity of the building is broken up, structural elements differentiated, new functions assigned. The weight carried by a wall could be relieved by an arch, and the thickness of the wall could thus be diminished. Furthermore, the apparent thickness of the arch was reduced if the arches could be concentrated on a small pier instead of being carried full side to the ground. By this means the main and most visible section of room was enlarged by several feet in each direction, a substantial improvement. This was made possible by diminishing the structural function of the wall and transferring it to other units such as piers and arches. This may not be Gothic architecture, but it is the Gothic idea in embryo.

1. The Transverse Vault

It was the transverse vault which solved the problem of the much needed wide stone roof. In this scheme the long tunnel vault is broken up by a series of arches carrying the whole weight of the vault, and these are connected by cross vaults. As the weight of the roof is thus concentrated on the arches and their piers, the lateral thrust on the walls is reduced to a minimum, and they can therefore be greatly lightened

and also safely pierced for good-sized windows high up.

The lateral pressure of the long tunnel vault has now been transformed into longitudinal pressures, for the little cross vaults which unite the great arches one to the other tend to push them over in either direction lengthwise of the building. In the cathedral these pressures are contained at one end by the portal with heavy flanking towers, and at the opposite end by the semi-circular apse or a series of radial chapels. In Persia, where the cross vault was invented, these lengthwise pressures are contained either by thick walls at both ends (Khan Ortma), or by an entrance portal flanked by minarets, as in the mosques, or by abutment on another structure, or by external flying buttresses, as at Yazd.

The oldest extant example of the transverse vault is in the ruined Ivan-i-Karka in Southwest Persia, built towards the end of the fourth century A. D. Here the long vault is broken up by powerful transverse arches which take up virtually the whole lateral thrust. The wall is hardly more than a curtain wall and is pierced high up for windows, as in the later cathedrals. Transverse vaults of a kind were used in the Taq-i-Qisra, though these were primarily tunnel vaults set at right angles to the main vault to take up some of the lateral pressure.

Tradition, supported by documents, affirms that Harun ar-Rashid built a section of the present Masjid-i-Jami of Kazvin. Adjoining the sanctuary, which is Seljuq work, 1104-1111 A.D., is a primitive vaulted oratory which seems likely to have been part of the original structure built by the great Baghdad caliph in the eighth century. Here also is a characteristic transverse vault. The Masjid-i-Jami in Shiraz (894 A.M.) was roofed with transverse

vaults of same character.⁸ The cross-vaults of the Khan Ortma in Baghdad (early 14th century) merely continue this traditional technique, which is even more perfectly exemplified in the lovely little oratory of the Masjid-i-Jami of Yazd, for which a date of 1385—the date of the mihrab in the adjacent sanctuary—seems certain.

If the Yazd oratory were the only Persian example which we had of the cross vault, it would be thought imprudent to relate it to European transverse vaults; but in view of the long history of this construction, we must assume the existence of many examples which were destroyed in the Mongol holocaust, or by earthquake, or other natural or human destructive agencies. This method of transverse vaulting has continued in Persia down to the present.

Here is one of the essentials of Gothic architecture which had already had a long life in Iran many centuries before its appearance in Europe. The earliest extant example of its use in Europe is the Church of St. Philibert in Tournus in Burgandy (1009-1019).

2. The Ribbed Ogival Vault

The ribbed ogival vault was destined, in conjunction with the transverse vault, to provide a final and satisfactory solution for the Gothic problem of security, space and light. Even though the weight of the roof was reduced by the transverse vault, it was still exceedingly heavy and created various problems. To lighten the roof and more perfectly organize and distribute the powerful forces engaged, a new type of construction was required.

The idea of independent framework which shall do most of the mechanical work, dividing the vault into compartments which exercise little structural function is not at all obvious, though its advantages

are immense, once achieved. In European architecture there were neither models nor traditions which could of themselves give birth to such a scheme; but in Iran the ribbed vault was indigenous, and it appears there before it appears in the West.

Are these Iranian vaults really ribbed in the architectural sense, and were they the source of the idea? The crucial examples are the vaults on the east side of the sanctuary of the Masjid-Jami of Isfahan.⁹ The dome, built by Nizam-ul-Mulk, vizier to Malek Shah, as the inscription declares, must have been constructed between 1080 and 1085 (possibly a little earlier). The piers are much earlier, as is shown by their form and dimensions as well as by the stucco ornament which still adheres to the impost blocks.¹⁰ The piers in what may fairly be called the 'library vaults' are contemporary with the older part of the sanctuary, and while the vaults which now crown them could be as late as the dome (Seljuq), they might also be much earlier. These vaults—whatever their date—are bold, skillful, confident constructions and, in view of the conservatism of Persian builders, the gradualness with which they developed their forms and the tenacity with which they hold to them, it seems certain that they are but late examples of a well established type.

There has been a general tendency to deny that the 'ribs' or 'armatures,' as they are sometimes called (a question-begging word), are genuinely structural.¹¹ The ribs in Vault 60 are salient by two feet at the deepest point; they penetrate the vault and they have stood firm, while several of the compartments have collapsed and are now filled in with rather haphazard repairs.

Although these ribs occasionally are indicated only by narrow lines one or two

⁹ First noted by the writer, photographed and studied in April-May, 1929.

¹⁰ See "Survey of Persian Art," Vol. II, p. 955 and Bull. Iranian Inst., Oct. '46.

⁸ See Schroeder, in "Survey of Persian Art," Vol. II, pp. 942-3.

bricks wide so that they hardly look structural, an examination of some of the deteriorating vaults shows that there are ribs almost wholly concealed which are six bricks wide. In most of the compartments the brick end-plugs have been shaken loose by the not infrequent earthquakes of Isfahan, and the panel has all but collapsed, showing that it was exercising little or no constructive function, while the ribs are almost intact and firm. Such ribs as those in the chapel of the Mausoleum of Uujaitu would, if the structure were intact, probably be dismissed as merely decorative. As a matter of fact, the lines of the ribs which are now visible are just the forward edge of a single line of plaster-coated bricks, but these are only the marking edge of thick ribs penetrating the vault, which on the upper side are salient by more than eighteen inches.

It is worthy of note that Persian builders use such ribs today in constructing domical vaults. They make the ribs first, and quite independently put in the compartments afterwards. These little ribbed domes are found all over Persia and obviously continue forms and habits established centuries ago.

The ribs in the half-dome of the Caravanserai at Tabas have been stripped of their plaster coating and show their powerful structural function. A similar construction was revealed in the Masjid-i-Jami of Kazvin when the nineteenth century dome at the portal was denuded. The robust intersecting ribs there were obviously meant to be the substantial framework of the whole structure. The interstitial panels are all slightly concave. The builders could not have been working for

decorative effect in these cases for the pattern could have been provided very inexpensively with about five per cent. of the construction which has gone into the making of these ribs.

Certainly the stout ribs of the two ivan vaults of the Masjid-i-Jami of Isfahan could have had no decorative intent, for they are visible only from the roof. Here the structural function is declared without the least ambiguity. The compartments of the north west ivan are themselves small vaults, convex, resting securely on the ribs which carry the whole structure. The main arch is heavily weighted on the haunches in order to pin it more firmly to the ground. The lateral pressure of the vault of the southwest ivan would thrust sideways the crown of the arch which carries most of the weight, were it not secured by a pair of lateral arches. Two other arches near the ends of the vault function similarly.

Other ribbed vaults in Persia also frankly reveal their structural function. The half-dome before the mihrab in the 15th century Masjid Bir-Chakmak of Yazd is supported by thin flat radial ribs salient in the groin by at least three feet, and curiously enough they are almost identical with the ribs in the cupola of the Cathedral of Coutances, and a number of other French monuments.

The scheme of ribs rectangular in section, springing at right angles from the wall, intersecting above and supporting a cupola (Isfahan Jami Vault No. 60) was apparently widely distributed. A famous example is found in the vault before the mihrab in the Great Mosque of Cordova built in 885 by El Hakim, who by his own witness sent for workmen from great distances. Here, however, according to the best judges, the system is not structurally employed. Ribs of similar character support in truly structural fashion several vaults (e.g. Hahpat).

¹¹ For the most effective criticism of the constructive character of these ribbed vaults, see Baltrusaitis, "Le probleme de l'ogive et l'Armenie," pp. 35-55. M. Focillon is also sceptical (cf. Focillon, *Moyen Age*, Paris 1943, pp. 111 ff.) A detailed comment would require more space than is available.

A more complicated system used for huge domes like that of the Mausoleum of Sultan Sanjar at Merve, which was built before 1158, has several striking counterparts in the south of France (St. Marie d'Oloron, l'Hôpital Saint-Blaise and other buildings in the region of the Pyrenees.) The ribs are not strictly structural, but they are echoes or relics of forms that originated as supporting framework.

The relation between the Armenian and Iranian vault forms presents an especially difficult problem. Which were prior, and what was the relation between Armenian and Iranian architecture from the tenth to the twelfth century? The evidence favors the priority of Iranian forms. For example, stallactites such as appear in the Porch of the Apostles at Ani were anticipated by more than a century in buildings disclosed at Nishapur by the expedition of the Metropolitan Museum.¹²

The vault with cupola carried on ribs set at right angles to the wall, must, judging by Vault 60 in the Isfahan Jami, have had a long prior history in Iran. Colonettes and column clusters were highly developed in Armenia, as we see from the interior of the Cathedral of Ani. Possibly the verticality of the smaller Dome Chamber in the Isfahan Jami was derived from an Armenian source. It was not built until after the Seljuq conquest of Armenia, when it would have been easy for the acquisitive, open-minded Seljuk builders to profit by Armenian examples. But even so, there are prior elements in Iran. The prior angle columns are developed at Nayin and had a long history elsewhere in Iran and also in Mesopotamia. Iran had a powerful and inventive architectural tradition centuries before important buildings were undertaken in Armenia. Communication between

the two countries was continuous from Parthian times on.

It is certain, however, that the masonry vaults of Armenia do mark a great advance on the brick vaults of Iran in strength, precision and technical finish. Some of these, such as those of Horomos Vank, Hahpat, and Ani, as Baltrušaitis has shown with great force and clarity, are the immediate antecedents of the ogival vaults of Gothic architecture; the connections between individual monuments in France are no closer or any more evident than the connections with which he has established the Armenian parentage of the French ogival vaults.

In judging the structural character of the early Persian vaults, we must not be confused or distracted by the purely decorative displays which the later Persian builders affected. Patterns that are developed for the mere joy in the interplay of line are fundamentally different from structural forces, and it is highly improbable that the superficial network of lines which imitates or suggests the concealed mechanical forces within could have provided the inspiration for the design of the essential structure. The reverse is more probably true: it was the inner structure which suggested and controlled the decorative surface play, just as, in Persian practice as early as Seljuq times, bricks are often concealed with a coating of plaster in which the underlying brick forms, bond and all, are marked out, including brick end-plugs. Even so, in order to refine and more delicately control the expression of the inner mechanical forces, the Persians sometimes applied over a vault or dome a decorative network of ribs, which in later periods were nothing more than thin wooden strips covered with plaster, with little more strength than was needed to hold themselves in position. But however mechanically insignificant, they al-

¹² cf. Bull. of the Metropolitan Museum, Section II, Vol. 33, No. 11—1938, "The Iranian Expedition of 1937."

ways indicate operating forces, and with a poetry and elegance which are sometimes very effective. That the builders did wish to conceal the cruder structural forces in order to give them a more poetic expression is shown in the early vaults, where the structural part of the rib is hidden, and only the projecting edge of one line of bricks is permitted to show through the plaster coating. These are the ones which are so deceptive and seem structurally so insufficient to mechanically-minded Westerners. The later Persians were so averse to the frank display of the more elemental structural forces that powerful ribs were uniformly concealed.

The argument from the mechanics of structure can be pressed too far. The exact structural function of the ribs in the various Persian vaults cannot be precisely ascertained without the dissection of a vault or detailed photographs of ruined vaults, but in any case the conclusion would not be decisive. In many architectural forms, which at their inception were primarily devices to solve pressing problems, the aesthetic factor assumes increasing dominance with the development of greater competence and control. After all, the buildings under discussion are practically all State or religious structures. They were not merely planned for protection and durability, but were conceived as expressions of deep feeling, and their architectural quality is in the last result the projection of such feeling, "l'architecte n'étant jamais un pur constructeur, mais étant toujours un artiste" (Focillon).

The confusion between architecture and engineering has led to many historical and aesthetic fallacies.¹³ Not mechanical veracity but the impressive effect, not engineering exactness but emotional expression, not the mere display of material forces but the spiritual response is the aim of the architect as artist. Psychological in-

tensity is sometimes more important than provable physical stability which looks and feels clumsy and inert. It is less essential that a building be physically powerful than that it appear so. It is more necessary architecturally that simple masses harmoniously composed should suggest reserve of power than that mechanical analysis should prove it to be there. The dome of St. Peter's does not look weak, but if the eight iron chains binding the drum were removed, it might collapse.

Both Persian and Gothic builders were striving for effect as much as stability. They both sought a well-integrated, rationally balanced play of forces. The colonnettes which emphasize the verticality of Gothic piers contribute little to their stability. The ribs which seem to strengthen the barrel vaults of Romanesque cathedrals actually diminish their strength. The seeming balance of forces in Gothic architecture which Viollet-le-Duc interpreted to mean that the whole structure was originally one—that the vault would collapse if a rib or buttress were removed—turned out under the cruel test of shattering bombardments somewhat deceptive.¹⁴ Ribs were severed but vaults stood. Presumably indispensable buttresses were fractured, but the roofs remained in place.

These facts, however, do not invalidate the psychological *effect* of a close-knit integrity nor the aesthetic function of non-constructive elements which emphatically *seem* to be constructive. We are not calculating engineering machines, and our sense of adequacy of structure is largely derived from childhood experiences, from the strength and character of our own bodily form and movements, not from tables and

¹³ See Geoffrey Scott, "The Architecture of Humanism." London, 1915.

¹⁴ cf. Pol Abraham, "Le Probleme de l'Ogive." Bull. des Instituts d'archeologie et d'histoire d'Art, Nov. 1935, also "Viollet le Duc et l'architecture rationaliste," Paris, 1936.

formulae. Just as the Gothic architects displayed with vivid eloquence structural power actively at work, so the Persians before them made use of similar processes and displayed similar power through exposed ribs, ponderous piers, soaring vaults, emphatically marking the direction of the forces engaged by the lay of the brick. The eye irresistibly follows parallel lines, and these are the more compeplling if a line be composed of a thin edge of a large brick emphasized by a contrasting bond. Even if the Isfahan vaults are not absolutely perfect structurally, neither are some of the French vaults; and if some of the thirteenth century flying buttresses, such as those at Rheims, are wrongly placed and threaten rather than conserve the mechanical stability of the building, the effect on the spectator is not impaired; only a mathematical calculation reveals the defect.

Historians of architecture usually assume that architectural forms could be transmitted only by travelling masons. The mason alone was aware of certain technical processes, and since he was likely to be as conservative as he was expert, he commonly utilized his accustomed techniques wherever he went. Thus the tracing of techniques gives sure evidence of affiliations and influence.

But some architectural forms could also be transmitted visually. A patron seeing and admiring a general affect and the more conspicuous elements in a structure, could have them imitated. At the siege of Damascus Timur was so enamoured of the dome of the Mosque of al-Walid that he apparently determined on the spot to have an imitation of it made in marble at Samarkand, as Creswell noted.

3. The Pointed Arch

The pointed arch, though less vital structurally in Gothic architecture than the transverse vault and the ribbed vault, is

almost universal in the style and is essential to its aesthetic character. Moreover, it had structural uses which solved a number of troublesome mechanical problems. Apparently it was at first aesthetically objectionable to both the Persians and the French Gothic builders, for the Persians used wherever possible the stronger elliptical arch, and the French, the stouter and more familiar round arch. But finally it won its way, until in both the Gothic and the Persian style it became dominant.

In the Orient the pointed arch has existed from time immemorial. Both Egypt and Assyria used the pointed vault, though always in a small way. The pattern and the possibility for a larger use were established by Sasanian times. The back of the facade of the Taq-i-Kisra shows an arcade composed of arches pointed in outline. They are not true pointed arches structurally, as they are composed of a few large bricks joined at slight angles to one another, so that the continuous transmission of thrust in the curved line, which is the essence of pointed arch, is lacking; but it was necessary only to enlarge this form, using more or smaller bricks, to obtain a true pointed arch, and in a generally progressive architecture such a development was probably inevitable.

The earliest true pointed arch which has survived is that of Qasr-ibn-Wardan in Syria (561 A.D.). This is a brick structure and therefore, as Professor Shapiro has pointed out, must be regarded as intrusive in Syria since that was a stone-building region. It could have come in only from the east, where brick building was all but universal.

The earliest true pointed arches in Persia proper are in the Tarikh Khaneh of Damghan, which by the complete agreement of all who have studied it must have been built about 750. These, like the arch of Aasr-ibn-Wardan, are only slightly

pointed, having been struck from two points only a little way apart. This is only a provincial structure continuing local Sasanian methods, hence it is impossible to say to what extent the form was used in monumental buildings of the seventh and eighth centuries which no longer exist, but in the Abbasid period in Baghdad, then almost completely under Persian dominance, the pointed arch was apparently almost universal, and the Nilometer in Cairo, built in 866 by an architect from Ferghana has four striking "Gothic" arches. Almost contemporary are the beautiful pointed arches in the Mosque of Ibn Tulun, and also those in the cistern of Ramleh in Philistia. Meanwhile by 894 when the Masjid-i-Jami of Shiraz was built the fully pointed arch was thoroughly established in Persia itself, though the round-headed arch was never entirely superseded there.

Thus the pointed arch was accessible to European builders long before they adopted it. In Egypt it was sure to be seen by merchants and pilgrims even before the Crusades. The earliest extant pointed arch in Europe is in the Bridge of the Admiral outside of Palermo, an admiral whose occupation took him frequently to the east Mediterranean where he could have seen many examples.

4. Compound Piers

Gothic architecture without its compound piers and column clusters would be sadly wanting. Greek, Roman and Egyptian columns are simple and solid. Persian, Armenian and Gothic piers are composite functionally or at least aesthetically. Does this affinity imply dependence? The compound piers of Ani give a probable answer, for Ani was dedicated in the year 1000, generations before any such pier was built in Europe.

But what of Persia? Compound piers of field-stone set in thin beds of mortar, a rude but significant form, appear in the

Masjid-i-Jami of Shiraz which was built in 894. The piers of the Masjid-i-Jami of Nayin (c. 960) have angle columns, while those of the "library vaults" of the Isfahan Jami can hardly be later than the tenth century, and they are even more complex. Though not sharply differentiated in function like true Gothic piers, these are very suggestive. The forces descending on them from the vaults above are clearly indicated and emphasized by the parallel lines of bricks. These are set vertically and edge-wise in the mortar beds, while the bricks in the panel between the two arches are set horizontally as if to resist the pressures of the converging arches. In short, the Persian has done by line approximately what the Gothic pier-builder did by tracery, make his pier tell an emphatic and convincing story of forces engaged. In neither case is the story altogether true. In both cases it is effective and helps to create a vivid awareness of the structure and its contagious energies.

In general character these early Persian piers supporting pointed arches and interesting vaults resemble in a quite surprising way their later counterparts in France, such as the crypt of the Cathedral of Auxerre. The scale is the same, and what is more, the style and the feeling are the same. Again the resemblance is close between the crypts of Gothic France and such constructions as the "library vaults" of the Isfahan Jami.

5. Flying Buttresses

Another indispensable element of Gothic architecture is the flying buttress. This is universally assumed to be a unique invention of the French builders; yet there are Persian flying buttresses and the idea had a long development there. The essence of this brilliant device is the transference of a thrust across an open space. In its crudest possible form this is the function of the

little arch and pier in the Palace of Sarvistan.

The expanding thrust of the dome of the Mausoleum of Ismail the Samanid (d. 907 A.D.) in Bukhara is transferred by an arch across an open space to the outer wall at the four corners. That this takes place under a roof does not alter the actual process or minimize its significance. A similar device (eight instead of four arches) supports the dome of a mosque in Medina. This is in the open air.

The lateral pressure of the crown of the vault in the southwest ivan of the Isfahan Jami, which would naturally tend to thrust sidewise the peak of the main supporting arch, is taken up by what is, in effect, a flying buttress with two heavier buttresses on the end counterweighted just as the flying buttresses of Gothic architecture are weighted down by pinnacles. Here is, in effect, the transmission of a thrust in an arc across what is structurally a void. Similar arches weighted in the same way transmit the thrust from the peak of the half-dome of the northwest ivan to a secure anchorage in well abutted walls.

Near the Duwazdah Imam in Yazd there are two little flying buttresses which pick up the endwise thrusts of a fairly long vault. The flying buttress in three leaps at the Masjid-i-Jami of Yazd is probably not older than the sixteenth century, clearly subsequent to the very high vault of the portal. But this is not the first flying buttress that was attempted at Yazd. On the north side of the city in an open lot where there has been considerable excavation for soil, the expedition of the Iranian Institute in 1934 discovered a smaller flying buttress, the base of which was a good twenty feet below the present ground level. This must date from a much earlier period than the buttress of the Jami portal.

More striking and quite in the Gothic manner are the flying buttresses of a

mosque at Ghayin, in east Persia, not far from the Afghan border. There the thrust of the vault is taken up by two graceful, widely curving flying buttresses, the thrust of the portal arch by buttresses on the upper side in rectangular profile, in response to the Persian taste which prefers to frame an arch or constitute a facade by a series of rectangular panels. Functionally these squarely framed arches serve exactly the same purpose as the usual thin curving buttresses. This monument has not yet been studied, but from all appearances it should date from the beginning of the fourteenth century. Its closest analogue is the single-nave mausoleum of Pir-i-Bakran near Isfahan. In any case, such an elaborate and knowing construction had plenty of antecedents, and it is one more proof that Persian builders could think in the Gothic manner.

6. The Demand For Verticality

The tendency to verticality has been native to Persian architecture since Sasanian times, and long before that in the great temples of Babylon and Assyria vertical panels and slender, deep-cut channels (perhaps for drainage) decorated and lightened the somewhat inert masses. The lofty vaults of the Palace of Ardashir at Firuzabad, built in the early third century (possibly, as Herzfeld has suggested, the Castle of the Grail, for Amfortas was a Persian legend) rival in height the vaults of Gothic Europe, while the vault of the Taq-i-Kisra rises 90 feet in the clear.

Moreover, the preference for verticality continued. The noble tomb tower of Qabus-ibn-Washmgir at Gurgan, dedicated in the year 1006, nearly 200 feet high from its foundation, with sharply diverging prismatic flanges, is one of the most impressive expressions of verticality in architectural history. Similar tomb towers were erected all across north Persia and into Armenia, at Nachshirvan.

The columns of the mihrab at Nayin are thin and elongated, nearly thirty diameters high. Lofty pointed arched portals, sometimes over a hundred feet high, mark the entrances to all the important Persian mosques. Persian and Armenian verticality approach each other in the Cathedral of Ani, and the small dome chamber in the Isfahan Jami (1088 A.D.). Both antedate any comparable construction in Europe, and the interior of Ani is so completely in the Gothic manner and mood that the relation between Ani and the French Gothic lacks but little of proof.

Actual chronological priority of some of the Persian structures which have Gothic character cannot be proven, but however desirable this would be, it is not absolutely necessary in order to establish the probability that Oriental models did inspire the European forms. The dating of many of the existing Persian buildings is difficult; though some are, happily dated, and others are datable, many remain doubtful. But there are, after a manner of speaking, no single, individual monuments in Persia. They all represent types.

Europe has seen many surprising, and even relatively sudden architectural inventions; Persia few. The apparent abrupt innovations in certain styles is an historical illusion, due to the destruction of the antecedent examples. For every developed architectural form in Persia, it is necessary to assume, whether examples have survived or not, similar, usually simpler precedent structures, prior even by centuries. This is the reasonable, even if intellectually uncomfortable, procedure.

For the question at issue, however, dating of the Persian examples is less important than it might seem. Every important structural feature in Persian architecture has evolved slowly and cautiously. The squinch, for instance, has a history of nearly 2000 years. From the clumsy simple

squinch in the second century Parthian Fire Temple of Rabat-i-Safid, to the distinguished squinches of the early seventeenth century (Mashad, Mausoleum of Khwaja Rabbi), or even of the early eighteenth (Isfahan, Madrassa Mader-i-Shah) there has been a host of gradual refinements, created by industrious exploration of all the variants and by invention.

From the first transverse arches at Ivan-i-Kharka (c. 490) to those in the lovely oratory of the Masjid-i-Jami of Yazd — a full thousand years — there is chiefly repetition and slow development. Moreover, the great vault of the Ivan-i-Karka itself is on too large a scale, shows too complete a mastery of the structural processes involved not to have had many antecedents.

Other characteristic architectural designs have equally long histories, like a pointed arch with a rectangular panel above it, the whole framed in an imposing arch or set in a panel, which begins as early as the eighth century B.C. and lasts to the present.

How these elements of style and these technical constructive processes could have reached Europe from remote Iranian, or more proximate Armenian, sources is a special problem. Many studies have already been made on Oriental contributions to Western art; others are in process, and all throw light on this particular problems. For the moment a few general considerations must suffice.

From prehistoric times on there has been a general drift of Asiatic influence into European culture. Oriental elements in Classical art are more potent and specific than we had thought. The declining Roman Empire in its last days was thoroughly Orientalized. The tremendous wars between Sasanian Persia and Byzantium released a flood of influences into Europe. This steady cultural drift westward continued even in the darkest part of the

Middle Ages. Spain was, of course, Muslim. Sicily was a focus of Eastern influences. Merchants maintained trade and cultural relations with the Orient. Almeria in Spain was famous for its textiles, some of which the chroniclers tell us were woven in the style of Isfahan. A Persian merchant established headquarters at Misra (Cairo), one son remaining in Isfahan and the other in Almeria as agents. "Montpellier," wrote Benjamin of Tudela about 1170, "is a place very favorable to commerce. Here come for trade a crowd of Christians and Saracens, Arabs, merchants from Lombardy and Rome, every part of Egypt, from Palestine, Greece, Gaul, Spain, England, Genoa and Pisa. Here they speak every language.¹⁵ On the east, Iranian influences penetrated up through the Caspian and the Volga. Scandinavian and Iranian merchants met at Novgorod. More than 80,000 Iranian coins of the tenth century or earlier have been found in Scandinavia, as well as Persian weights and measures and other evidences of a lively and prolific trade. Longpérier found many Persian and Oriental names in the cemeteries of old Gaul, as southern France had many colonies of Oriental merchants. Italy had been in continuous contact with the Orient since Classical times. St. Geneviève of Paris exchanged messages with Simon Stylites on his pillar by means of the French merchants traveling between France and Syria. In the upbuilding of the Church, both in ritual and in architecture, constant reference was necessary to the Oriental lands, the scene of the great events of Christendom, the land where traditions were still alive and presumably authentic. Thus, Abbot Suger "loved to talk with those who had been to Jerusalem."

Prior to the Crusades¹⁶ there was an

immense traffic of pilgrims to the Holy Land, of such density and eagerness that it was necessary to impose severe travel restrictions. One could not board a vessel at Marseilles to the Holy Land without a return ticket.

The arts reflected these influences. The *coffre* belonging to Mr. Edward J. Holmes, which was found at Rayy and is inscribed and dated 1197, might well pass for a thirteenth or fourteenth century French original.¹⁷ Professor Monneret de Villard has found an important record of an Armenian prelate and an entourage of some 60 persons who came to northern Italy in the eleventh century, and this prelate was responsible for the construction of a small vaulted church north of Milan. The publication of this most significant discovery is eagerly awaited.

The fortified churches of the Midi reflect specific architectural forms of Syria, and both the crooked entrance and machicolis are Oriental in origin. A little church at Boulogne-sur-Mer reflects very closely the Bab-el-Futh in Cairo, which a company of Boulognaises must have seen on a visit to Cairo during the First Crusade.¹⁸ Scores of similar instances might be cited. The Prior of La Charité-sur-Loire was taken prisoner in the First Crusade,¹⁹ and Baghdad at the time was full of magnificent Seljuq architecture, the finest of it built under the patronage of Nizam-ul-Mulk, the famous vizier of Alp Arslan, and Malek Shah, under whose patronage the great dome of the Isfahan Masjid-i-Jami was built. The clocher at La Charité-sur-Loire, built after the Prior's return from his imprisonment, has a blind double

¹⁷ cf. "Survey of Persian Art," Vol. VI, pl 1303, A. B.

¹⁸ cf. Camille Enlart *L'église du Wast et son portail arabe*,... *Gazette de Beaux Arts*, Ser. V, vol. 16 (1927).

¹⁹ I owe this reference to Miss Joan Evans, another significant document for which early publication is earnestly needed.

¹⁵ Quoted by Raymond Ray, "Les Vieilles Eglises Fortifiées," p. 106.

¹⁶ Jean Ebersolt, "Les Relations entre l'Europe et l'Orient avant Les Croisades," Paris.

arcade with a trefoil niche crowning the upper course which corresponds very exactly to the design of the Baghdad gate at Rakka. The model could have been derived from Spain, but the goor Prior could hardly have failed to see that gate, and it was, moreover, by no means unique, but must have had many parallels throughout the Orient.

Cathedrals like that of Le Puy were replete with Oriental influence, including ornamental Kufic inscriptions,²⁰ one unmistakable proof of the actual presence there of Muslim workers.

Even the facades sometimes show marked similarities. The Baghdad Gate of Rakka with its arched portal and two lateral arcaded galleries, the facade of Rabbath Ammon in Transjordan, such mosques as that of Asterjan with its vaulted entrance and paired tower-like minarets which opens into a long nave, all are congenial to the Gothic spirit, and the earlier examples definitely antedate comparable Gothic compositions. Some of the elements have, no doubt, Hellenistic sources, but these were further developed in the Near East and received the stamp of Sasanian and Early Islamic architecture. The little church at Airaines and Mouen with their blind arcades are examples of many which reflect the Oriental mode.

One consideration is likely to militate against the thesis of an alien contribution to Gothic architecture, the theory that it is possible to form a series of structural elements from French buildings which develop almost imperceptibly out of one another from the very most primitive beginnings. From this it is inferred that the completed style was a gradual and continuous fulfillment out of these simple origins, so that any idea of intervention

from external influences is superfluous.

There is perhaps a common logical fallacy concealed here. A continuous series is not necessarily generative. There is no real causal or productive relation in the number system, and high indiscernibles can be arranged in an order which is so continuous as to seem to be homogeneous and self-generating. But even such apparently continuous systems can be stimulated and nourished from outside, and the tentative beginnings may easily be the record and imitation of novel suggestions timidly adopted with the minimum of variation from accepted styles. Such a series can be repeatedly sustained and invigorated from external sources without serious dislocation.

The notion of spontaneous cultural generation, like the theory of parallel independent inventions of complex techniques, styles and conceptions, has in recent years under the relentless pressure of fact given way to the more realistic theory that cultural process is the result of challenge and interchange between contrasting cultures, where the differentiation becomes the motive power for new achievement.

The flood of constructive influences that poured into Europe from the East both before, and in greater volume after the Crusades touched every phase of Western life. It would be strange indeed if the West could have learned from the East many of the refinements of life—manners, costumes, music, calligraphy—could have modeled their poetry as did the troubadours and the minnesingers, on Eastern models could have taken over from the same source chivalry and heraldry, could have respected and utilized Eastern methods in business and finance, could have adopted Eastern techniques in their fortifications, copying for example the form of the walls of Antioch (Agde, Castelnaud-

²⁰ cfa. Fikry, *L'art Roman du Puy . . .* Paris, 1934.

Pégayrolles, Royat, Lucheau)²¹, could have imitated Eastern brick-work by the *petit appareil*, could have reproduced the Persian squinch, the blind arcade, copied many decorative motives; could have done all this and yet been indifferent or unresponsive to the suggestions which could have led directly to the solution of their most urgent problem—how to build their churches for the new era.²²

Pol Abraham

Nouvelle Explication de l'architecture religieuse gothique, Gazette des Beaux Arts, Paris, 1934

Viollet le Duc et l'architecture rationaliste—Paris, 1934

Marcel Aubert

Les plus anciennes croisees d'ogives . . . — Paris, 1934

Jurgis Baltrusaitis

Etudes sur l'art medieval en Georgie et en

²¹ Raymond Ray, "Les vieilles eglises fortifies," Chapter II.

²² The problem of the origins and development of Gothic architecture is by no means as simple as it can be made to sound. All the terms need the most searching and precise criticism: affiliation, imitation, copying—transference by actual workmen, independent invention, the mingling and degeneration of forms—all these need clarification and specification. To distinguish between superficial resemblances or the apparent identity of certain details, and the more important and fundamental community of principles, that come from ways of thinking, from common attitudes towards common problems, this is one of the primary tasks of the historian of architecture—an approach that has always distinguished the work of the late Henri Focillon, whose discussion of the very complicated problem of the ribbed vault in his *Moyen Age* remains a model and masterpiece. M. Aubert has given the fullest history of the *croise d'ogives*, and M. Baltrusaitis has made the most brilliant single contribution to the problem of origins. Of the vast literature on Gothic architecture only a relatively small proportion is given to the question of Oriental influences. The following brief list may be of some help to those who want to pursue this very significant problem.

Armenie—Paris, 1928

Le Probleme de l'ogive et l'Armenie—Paris, 1933

J. Puig-i-Cadafalch

La geographie et les origines du premier art roman — Paris, 1935, especially Chap. VI Les Origines

Auguste Choisy

L'Histoire de l'Architecture, Paris, 1899

K. A. C. Creswell, Early Muslim Architecture (2 vols.), Oxford, cf. especially sections on the squinch and the pointed arch

Jean Ebersolt

Orient et Occident—Paris, 1928-29

Camille Enlart

Manuel d'archeologie francaise, Architecture religieuse—Paris, 1919

L'eglise du Wast en Bouglonnais et son portal arabe, Gazette des Beaux Arts, Ser. 5, V-16, (1927)

Ahmad Fikry

L'art Roman du Puy et les influences islamiques Paris, 1934

Henri Focillon

Moyen Age—Paris, 1943

Art d'Occident, Le Moyen Age Roman et Gothic—Paris, 1938

Elie Lambert

Les premiers voutes nervees francais et les origines de la croise d'ogives—Revue archeologique, 1933

Les voutes nervees hispano-moresques et leur influence possible sur l'art Chretien—Hesperis, V—(1928)

Robert de Lasteyrie

L'architecture religieuse en France a l'epoque romane—Paris, 1912

A. Kingsley-Porter

Lombard Architecture, 1917

J. Vallery-Radot

Eglises Romanes—Paris, Coll. A traverse l'art francais

Raymond Rey

Les vieilles eglises fortifies, Paris, 1925

Survey of Pesian Art

(Pope, ed.) 7 volumes, Oxford, 1938—Articles, photographs and drawings by Schroeder, Reuther, Monneret de Villard, Pope, Vols. I, II, V. VI.

V. Sabouret

Levolution de la voute du milieu du XIe siecle au debut du XIIIe—Paris, 1934

Marquis de Vogue

Architecture civile du Ier au VIe siecle dans la Syrie centrale—Paris, 1866-1877

Henri Terrasse

L'art Hispano-Mauresque—Paris, 1932